

Application No. 09/972,428

NMTI 1002-4  
(747 CON 2)In the claims:

This listing of claims will replace all prior versions and listings of claims in the application:

1. (withdrawn) A method of fabricating a layer of material in an integrated circuit (IC), the layer including a pattern, the layer defined by a layout data, the method comprising:

analyzing the layout data to determine whether substantial portions of the pattern are to be defined using a phase shifting pattern; and

responsive to the analyzing, configuring an optical lithography exposure system to have a setting of a set of one or more optical parameters that control characteristics of exposures, to expose at least a first mask pattern and a second mask pattern for use in defining the layer of material to use said setting for exposing each mask pattern, and wherein the first mask pattern comprises an alternating aperture phase shifting pattern and wherein the second mask pattern comprises a trim pattern.

2. (withdrawn) The method of claim 1, wherein the analyzing comprises determining if all of the pattern on the layer is defined using phase shifting.

3. (withdrawn) The method of claim 1, wherein the layout data comprises a "full phase" design such that the first mask pattern comprises a "full phase" mask pattern.

4. (withdrawn) The method of claim 1, wherein the analyzing comprises determining if one or more of all of the pattern is defined using phase shifting, wherein a pattern is exposed on the layer which can be characterized by one or more of the following: at least eighty percent (80%) of the non-memory portions of the pattern are defined by the phase shift pattern; at least eighty percent (80%) of a part of the floorplan in the pattern is defined by the phase shift pattern; at least ninety percent (90%) of the pattern is defined by the phase shift pattern; all of the features in the critical path of the pattern are defined by the phase shift pattern; all features in the pattern except those features that are not phase shifted due to phase conflicts are defined by the phase shift pattern; everything in

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the pattern except test structures are defined by the phase shift pattern; and everything in the pattern except dummy structures are defined by the phase shift pattern.

5. (withdrawn) The method of claim 1, wherein a pattern is exposed on the layer which can be characterized by having at least ninety-five (95%) of the pattern defined by the phase shift pattern.

6. (withdrawn) The method of claim 1, wherein the optical lithography exposure system comprises at least one of a stepper and a scanner.

7. (withdrawn) The method of claim 1, wherein the first mask pattern and the second mask pattern are on a single reticle.

8. (withdrawn) The method of claim 1, wherein said set of optical parameters consists of the numerical aperture (N.A.), wavelength ( $\lambda$ ) of radiation, partial coherence ( $\sigma$ ), illumination configuration, and defocus.

9. (withdrawn) The method of claim 1, wherein said set of optical parameters comprise one or more of the numerical aperture (N.A.), wavelength ( $\lambda$ ) of radiation, partial coherence ( $\sigma$ ), illumination configuration, and defocus.

10. (withdrawn) The method of claim 1, further comprising exposing the layer of material in the optical lithography exposure system using a first dosing for the first mask pattern and a second dosing for the second mask pattern, the first dosing and the second dosing in a ratio of 1.0 to  $r$ ,  $r > 0.0$ .

11. (withdrawn) The method of claim 10, wherein  $2.0 \leq r \leq 4.0$ .

12. (withdrawn) The method of claim 10, wherein the first mask pattern and the second mask pattern are on a single reticle.

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13. (withdrawn) The method of claim 12, wherein the exposing further comprises blading the first mask pattern and second mask pattern during the exposing to permit different dosing.

14. (withdrawn) The method of claim 12, and wherein the single reticle further includes a second instance of the second mask pattern and wherein the exposing comprises exposing the layer of material to the single reticle in a pattern to cause a 1:2 exposure ratio between the first mask pattern and instances of the second mask patterns.

15. (withdrawn) A reticle for use in defining a pattern in a layer of material of an integrated circuit (IC) production using optical lithography in an optical lithography exposure system having a set of one or more optical parameters that control characteristics of exposures, the reticle for defining a layer of material in an IC, the reticle comprising at least two patterns:

a first pattern comprising a phase shifting mask; and

a second pattern comprising a trim mask,

the first pattern defining a sufficient amount of the layer of material using phase shifting to allow the use of substantially the same settings of said set of one or more optical parameters for both the first pattern and the second pattern.

16. (withdrawn) The reticle of claim 15, wherein a pattern is exposed on the layer which can be characterized by one or more of the following: at least eighty percent (80%) of the non-memory portions of the pattern are defined by the phase shift pattern; at least eighty percent (80%) of a part of the floorplan in the pattern is defined by the phase shift pattern; at least ninety percent (90%) of the pattern is defined by the phase shift pattern; all of the features in the critical path of the pattern are defined by the phase shift pattern; all features in the pattern except those features that are not phase shifted due to phase conflicts are defined by the phase shift pattern; everything in the pattern except test structures are defined by the phase shift pattern; and everything in the pattern except dummy structures are defined by the phase shift pattern.

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17. (withdrawn) The reticle of claim 15, wherein a pattern is exposed on the layer which can be characterized by having at least ninety-five (95%) of the pattern defined by the phase shift pattern.

18. (withdrawn) The reticle of claim 15, wherein said set of optical parameters consists of the numerical aperture (N.A.), wavelength ( $\lambda$ ) of radiation, partial coherency ( $\sigma$ ), illumination configuration, and defocus.

19. (withdrawn) The reticle of claim 1, wherein said set of optical parameters comprise one or more of the numerical aperture (N.A.), wavelength ( $\lambda$ ) of radiation, partial coherency ( $\sigma$ ), illumination configuration, and defocus.

20. (withdrawn) The method of claim 15, wherein substantially the same comprises within plus or minus 10%.

21. (withdrawn) The reticle of claim 15, wherein the reticle further includes a third pattern substantially identical to the second pattern, such that the layer defined by a triple exposure comprising one exposure by the first pattern, one exposure by the second pattern, and a third exposure by the third pattern.

22. (withdrawn) The reticle of claim 15, wherein the reticle further includes a third pattern comprising a phase shifting pattern, and wherein the first pattern for defining features oriented in a first direction in the pattern and the third pattern for defining features oriented in a second direction in the pattern, such that the layer defined by a triple exposure comprising one exposure by the first pattern, one exposure by the second pattern, and a third exposure by the third pattern.

23. (canceled)

24. (currently amended) The method of manufacturing an IC product of claim 32 [[23]], wherein the first mask pattern comprises a "full phase" mask.

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25. (currently amended) The method of manufacturing an IC product of claim 32 [[23]], wherein the pattern on the layer of material can be characterized by having at least ninety-five percent (95%) of the pattern defined by the phase shifting pattern.

26. (currently amended) The method of manufacturing an IC product of claim 32 [[23]], wherein the optical lithography exposure system comprises at least one of a stepper and a scanner.

27. (canceled)

28. (currently amended) The method of manufacturing an IC product of claim 32 [[23]], wherein said set of optical parameters consists of numerical aperture (N.A.), wavelength ( $\lambda$ ) of radiation, partial coherency ( $\sigma$ ), illumination configuration, and defocus.

29. (currently amended) The method of manufacturing an IC product of claim 32 [[23]], wherein said set of optical parameters comprise one or more of numerical aperture (N.A.), wavelength ( $\lambda$ ) of radiation, partial coherency ( $\sigma$ ), illumination configuration, and defocus.

30. (currently amended) The method of manufacturing an IC product of claim 32 [[23]], wherein substantially the same comprises within plus or minus 10%.

31. (canceled)

32. (previously presented) A method of manufacturing an integrated circuit (IC) product comprising:

exposing a pattern in at least one layer of material in the IC using at least two mask patterns, the first mask pattern comprising a phase shifting pattern and the second mask pattern comprising a trim pattern, the phase shifting pattern defining substantially

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all of the pattern of the layer of material and the trim pattern for protecting the pattern defined using the phase shifting pattern and clearing phase shifting artifacts;

    said exposing using an optical lithography exposure system having a setting of values of a set of one or more optical parameters that control characteristics of exposures, to the first mask pattern and the second mask pattern, where said setting of values is substantially the same while exposing the first and second mask patterns, and using a first dosing for the first mask pattern and a second dosing for the second mask pattern, the first dosing and the second dosing being in a ratio of 1.0 to  $r$ , wherein  $2.0 \leq r \leq 4.0$ .

33. (currently amended) The method of manufacturing an IC product of claim 32 [[23]], wherein the first mask pattern and the second mask pattern are on a single reticle.

34. (original) The method of manufacturing an IC product of claim 33, and wherein the exposing further comprises blading the first mask pattern and second mask pattern on the reticle during the exposing to permit different dosing.

35. (previously presented) A method of manufacturing an integrated circuit (IC) product comprising:

    exposing a pattern in at least one layer of material in the IC using at least two mask patterns, the first mask pattern comprising a phase shifting pattern and the second mask pattern comprising a trim pattern, the phase shifting pattern defining substantially all of the pattern of the layer of material and the trim pattern for protecting the pattern defined using the phase shifting pattern and clearing phase shifting artifacts;

    said exposing using an optical lithography exposure system having a setting of values of a set of one or more optical parameters that control characteristics of exposures, to the first mask pattern and the second mask pattern, where said setting of values is substantially the same while exposing the first and second mask patterns, wherein the first mask pattern and the second mask pattern are on a single reticle, and wherein the single reticle further includes a second instance of the second mask pattern and wherein the exposing comprises exposing the layer of material to the instances of the mask

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patterns on the single reticle in a sequence to cause a 1:2 exposure ratio between the first mask patterns and instances of the second mask pattern.

36-55. (canceled)

56. (currently amended) The method of manufacturing an IC product of claim 32 23, wherein the pattern on the layer of material can be characterized by one or more of the following: at least eighty percent (80%) of the portions of the pattern that do not form memory devices are defined by the phase shifting pattern; at least eighty percent (80%) of the ~~floorplan~~ in the pattern is defined by the phase shifting pattern; at least ninety percent (90%) of the pattern is defined by the phase shifting pattern; all of the features in the critical path of the pattern are defined by the phase shifting pattern; all features in the pattern except those features that are not phase shifted due to phase conflicts are defined by the phase shifting pattern; everything in the pattern except test structures are defined by the phase shifting pattern; and everything in the pattern except dummy structures are defined by the phase shifting pattern.